RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS, Revision A

Meeting #16

WG-3 Response to Eurocae WG-51 SG-1 Comments on Draft DO-260A

Presented by Vincent Orlando

SUMMARY

Eurocae performed a detailed review of DO-260A and provided their comments as contained in working paper 1090-WP-16-03. WG-3 reviewed each of these comments and took action as indicated in this working paper. The "G" and "P" reference numbers are those contained in the Eurocae comments.

WG-3 Response to Eurocae DO-260A Comments

G1: SARPs Compatibility Question

WG-3 has been working with SCRSP WG-B, the WG responsible for the Extended Squitter (ES) SARPs, to provide information on the revision being made to DO-260A. At the Rio meeting (April 2001) WG-B reviewed material for Traffic Information Service Broadcast (TIS-B) and tasked its Technical Subgroup (TSG) to monitor TIS-B development and to prepare a revision to add TIS-B to the ES SARPs.

At the Langen meeting (November 2002) WG-B reviewed material relating to modifications to the ADS-B function of ES. WG-B tasked the TSG to prepare a revision to the ES SARPs to include this new material for WG-B review at its next meeting (May 2003). The only significant change to the surveillance and identification formats is the change from NUC to NIC in the interpretation of the message type code. The more significant change is to intent reporting. The former Trajectory Change Point (TCP) message has been replaced by the Target State and Status message and the Aircraft Operational Status message has been expanded.

WG-B also tasked the TSG to prepare a brief SARPs revision to cover the receiver portion of and ES installation, especially the material on enhanced squitter reception. The approach specified by WG-B was to develop a minimum core SARPs statement that makes reference to DO-26A. The TSG is tasked to provide a draft of this material for review at the May 2003 meeting of WG-B.

G1: Backward Compatibility Example

Concur: There were errors in Table 2-11 and Table A-2 with respect to the usage of the NIC Supplement in several TYPE Codes. The entry for Type Code 6 should have been $R_c < 25$m, not 75m, and should not have used the NIC Supplement. With this error corrected, a message with Type Code 6 would be interpreted by a Rev 0 receiver as having a maximum HPL of 25 meters. The coding has been specified so that the Rev 0 equipment inability to receive the NIC Supplement will always cause its decoded limits to be greater than the value being transmitted by a Rev 1 system. Note also that SIL and HFOM were not defined for a Rev 0 system.

G2: Latency difference between latitude and longitude should not occur, since latitude and longitude are contained in the same message (and therefore received at the same time). Further, the same navigation position fix will be used for latitude and longitude so there should be no latency difference.

The end-to-end latency required by the ADS-B MASPS is 1.2 seconds, of which 200 milliseconds is allocated to the transmitter. This allocation was a requirement reflected in DO-260 and remains the same in draft of DO-260A. Refer to §3.3.3.2 in the ADS-B MASPS.

G3: This topic is currently under consideration by RTCA SC-186 Working Group 4 in their development of the Airborne Surveillance Applications MASPS.

G4: The purpose of defining status bits is to permit the reporting of partial data in the event of the failure of an onboard system. Certification standards will specify the minimum set of data that must be provided in order to be certified for a particular application. Note that the use of status bits is an inherent part of the register formats defined for Mode S Specific Services.

G5: This is a new requirement relative to the current ADS-B MASPS. This topic is currently under consideration by RTCA SC-186 Working Group 4 in their development of the Airborne Surveillance Applications MASPS. This issue will have to be addressed in a future ADS-B MASPS version, if necessary.

G6: This is a new requirement relative to the current ADS-B MASPS. This topic is currently under consideration by RTCA SC-186 Working Group 4 in their development of the Airborne Surveillance Applications MASPS. This issue will have to be addressed in a future ADS-B MASPS version, if necessary.

G7: This material is intended to provide detailed requirements on message formatting to serve as the basis for the specification of test procedures. The material in these sections is not intended to be included in the SARPs at this level of detail. The material in §2.2.3.2.3.7.2 contains specifications that must be stated in order to have standardized formatting for the precision and non-precision cases. Note that the techniques mentioned for position extrapolation is only included for guidance, there is no requirement to use any particular technique.

P1: Concur, these were corrected in a draft later than the one reviewed.

P2: ES has only a limited message capacity as constrained by the Mode S System SARPs (a maximum of 6.2 ES transmission per second). There is no excess capacity available to convey DAPS data, and, in any event, ADS-B is not intended to replace ground Mode S interrogators for the air-ground delivery of DAPS. An addressed service is a much more efficient technique for the air-ground transfer of DAPS information.

P3: Unlawful interference is being addressed in the 1090 MOPS, with the use of the Extended Squitter Aircraft Status Message and the Emergency/Priority parameter in the Aircraft Operational Status Message. Features are also being added to Mode S Transponders to maintain operation during unlawful interference actions. Additionally, this is a very relevant topic that should be considered in a future revision to the ADS-B MASPS.

P4: Appendix A is intended to be a bridge document between the MOPS and the ES SARPs, in order to make it easier to trace requirements between these two documents. Except for the material on Compact Position Reporting (CPR), most of the material in Appendix A is a summary of the message formatting portions of the main body of the MOPS.

P5: The word “must” is used in place of “**shall**” to cover general requirements that are specified in more detail elsewhere in the document. Every use of the word “**shall**” requires a test in the test procedures, so the use of must for general requirements indicates a requirement without invoking the need for an infeasible test procedure.

P6: Concur

P7: Concur

P8: A manufacturer defines the functions to be included in a particular piece of equipment, and these functions would then comply with the applicable MOPS.

P9: Concur.

P10: Concur

2.2.3.2.1.2 “CA” Capability Field (used in DF=17)

a. Definition: -- The “CA” field is a 3-bit (Message bits 6 through 8) field used to report the capability of an ADS-B transmitting installation that is based on a Mode S transponder. ~~For the most part,~~ The “CA” field is used to report the data link capability and notice of a transponder condition that requires interrogation by the ground ~~and~~ It is used in Mode-S downlink format DF=11, i.e., the Mode-S All Call reply and short squitter.

P11: Concur

The “AA” field is a 24-bit (Message bits 9 through 32) field that **shall** contain the address ~~ICAO 24-bit Address~~ of the transmitting installation. This is intended to provide unambiguous identification of the A/V being described in the ADS-B or TIS-B Message.

P12: Concur. See **P11**.

P13: Concur

The type of address (whether a~~n~~ 24-bit ICAO address or some other kind of address) contained in the AA field depends on the value of the DF field, and the CF or AF field~~s if present, and~~ when DF=18 or 19.

P14: Concur

Change “shall” contain to “contains” in the referenced paragraph.

P15: Concur

P16: Concur, note 2 removed.

P17: The title is consistent with the style of similar Figures in these MOPS.

P18: The title is consistent with the style of similar Tables in these MOPS.

P19: The title is consistent with the style of similar Tables in these MOPS.

P20: The term “these MOPS” is the standard form adopted for DO-260. All earlier occurrences of “this MOPS” have been converted. See answer to P1.

P21: It is only intended for Equipment Class A3. This requirement enhances long range performance, which only applies to Class A3.

P22: Info, no action required.

P23: Concur. Corrected in a later version.

P24: Concur. Corrected in a later version.

P25: Concur. Corrected in a later version.

P26: Concur: Text updated

P27: Concur: Text updated

P28: Concur: Text updated

P29: This is a certification issue.

P30: Info, no action required.

P31: Please be specific on references and we will insert as requested.

P32: Concur

P33: Table E-1 indicates performance for a worst-case transponder/transmitter power. The 90NM effective range at 95% probability of reception assumes that the target aircraft would be employing transmitters statistically distributed over the allowed power range. See the Note to Table E-1.

P34: Concur – "ADS-B" deleted

P35: Concur
P36: Concur. Text revised

P37: Concur. Text revised

P38: Info, no action required

P39: Concur, "partial" removed

P40: Yes

P41: A switch is provided on the transponder control panel to inhibit the insertion of barometric pressure altitude in Mode S and Mode C replies. This same switch will inhibit the reporting of barometric pressure altitude in the ES Airborne Position Message.

P42: This section has been updated since the copy reviewed. This section now applies to the update rate for Target State and Status Message. The rate was selected to meet the ADS-B MASPS requirement for class A3 equipment.

P43: Concur. Change "Lat/Lon" to "lat/lon" to be consistent with the rest of the document.

P44: Concur, but this section had already been updated in a later draft of Appendix A.

P45: Concur. Add text to the end of Note 3.

P46: Info, no action required

P47: The acronyms "II" and "SI" only appear once in the MOPS document in connection with the coding of the PI field. These codes are not a key part of ES since it is a broadcast service. Given the limited connection between II and SI codes and ES, it does not seem appropriate to include them in the list of acronyms.

P48: Concur

Garble, Non-synchronous ~~—~~ Interfering reception of two or more replies. Interfering replies received from a transponder that is being interrogated by some other source is called FRUIT.~~Reply pulses received from a transponder that is being interrogated from some other source. Also called FRUIT~~.

P49: Concur.

Add the following to the list of definitions:

Mode S. A secondary surveillance radar (SSR) system that operates using addressed interrogations on 1030 MHz and transponder replies on 1090 MHz. Mode S supports a two-way data link and an ADS-B service known as Extended Squitter.

P50: As for II and SI codes, basic surveillance and enhanced surveillance do not seem relevant to a broadcast service such as Extended Squitter.

P51: Concur. Definitions of NIC and NAC added

P52: Acquisition and Extended Squitter are included in section B2.

P53: Appendix C provides a summary of antenna gain measurements and analysis. The referenced material is valuable to those simulating the performance of ES.

P54: Concur

P55: Adjusted the title of the table to clarify that the intent of the table is to show computations for link budget ranges.

P56: Adjusted the title of the table to clarify that the intent of the table is to show computations for link budget ranges.

P57: This is not feasible within the transmission budget allocated to ES. See answer to comment P2